

D.W. Malachuk

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Extract from report on

"THE HUDSON BAY RAILWAY BELT AND HUDSON BAY"

Issued from

The Natural Resources Intelligence Service

Department of the Interior

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### NAVIGATION

Boats of all sizes and descriptions, from small sailing craft to modern ocean freighters, have been entering and leaving Hudson Bay via Hudson Strait for two and a half centuries during which time the losses have been reasonably light, the records of the Hudson Bay Company, which are especially favourable, showing the destruction of only two ships. In recent years as many as 38 recorded passages have been made through the straits in a single season (1914) without serious accidents. Many divergent opinions have been expressed as to the duration of the navigable season. The ice packs from Fox Channel which are carried by wind and currents into the straits in early summer, the snow storms which often prevail after the middle of September, and the long hours of darkness and cold late in the fall, are serious menaces to a prolonged shipping season. Aids to navigation such as, lighthouses, wireless, special pilots, aeroplane observation of the ice packs, etc., would be of material assistance in enabling boats to make the passages successfully in June, July, October and November. The Bay itself could possibly be navigated the year round if the harbour approaches were kept open by ice breakers. In October and November and early in the season, before the ice is completely melted, several days of fogs and haze may be encountered but for the most part the weather is clear. Serious magnetic disturbances of the compass must also be allowed for.

### Currents.

Two prevailing ocean currents, one eastward and one westward, can be traced in Hudson Strait, both of which have an important bearing on navigation due to the ice fields they carry with them. From the Atlantic a branch of the main Arctic current flowing south through Davis Strait enters Hudson Strait at Resolution Island and can be traced along the north shore as far as Big Island where it is believed to turn and work its way back eastward. In November and early in December this current brings field and berg ice with it which, under certain conditions, blocks the Atlantic entrance to the straits.

The eastbound current comes from Fox Channel and is diverted by Southampton Island so that it follows the southern shore of Hudson Strait joining the Labrador-bound Arctic current just off the Button Islands. The ice which it carries is ordinarily found at the western entrance late in the fall and early in the summer, "rafted" together under pressure and forming fields of wide, irregular surfaces and impenetrable bulk. These packs begin to melt in June and during July the cementing ice material is sufficiently thawed to permit a steamer cutting through, the ice masses falling into pieces with considerable commotion, but with little risk of damage to a well built boat.

Currents starting in Ross Welcome also follow the coast of Hudson Bay, travelling south on the west side and north along the east shore, but they carry relatively little ice and form no impediment to navigation.



Length of Season

A brief tabled summary of the published opinions of a large number of men-mariners, scientists, government officials, explorers and traders - all experienced or well informed on the difficulties of travel in northern waters, as to the open and closing dates of navigation in Hudson strait, is herewith presented.

Statement re  
Navigable Season in Hudson Strait

Witness		Years in Northern Waters	Opinion as to Season for Navigation in Hudson Waters,			
			Begins.	Ends.	Duration.	
Capt.F.Anderson,	Canadian Naval Service, in com- mand of Exped- itions 1911-14	4	July 15	Nov.15	17wks.	
Capt.H.E.Webb,	SS.Bonaventure	2	July 25	Oct.15	12 "	
Thos.Harling,	Ship broker, Montreal		"	3 Summer months	13 "	
N.B.Saunders,	Agent, Dept. Rys. & Canals.		Aug. 1	Oct.28	13 "	
Capt.Wm.Wakeham,	Dept.Marine & Fisheries.	Several	July 1-10	Oct. 15-20	14-16 "	
Capt.M.Bartlett,	With Comm.Lowe S.S.Neptune	1	July 31	Nov. 1	13 "	
Capt.A.Kean,	SS.Prospero	40	Aug. 1	Oct.11	13 "	
			(For ordinary vessels)			
			June 30	Nov.30	22 "	
			(For special boats)			
Capt.C.Couch,	Newfoundland	8	July 15	Oct. 5	12 "	
Capt.C.R.Sinclair	Merchant Navy	6	"3½ - 4 Mths"		15-17 "	
Capt.Adams,	Whaler "Arctic"	35	June 20-25	Oct.25	18 "	
Admiral Markham,	Accomp.Comm. Gordon on Off- icial navigations, investigations, 1886.		Variable		Variable 17 "	

Witness		Years in Northern Waters	Opinion as to Season for Navigation in Hudson Strait.		
			Begins.	Ends.	Duration.
Dr. Robt. Bell, FRS.,	Geologist Scientist.	17	June 15	Oct. 20	22 wks.
Commander Gordon,	Commanding ex- peditions 1884-6	3	July 1-10	Oct. 1-10	12-15 "
			(Delays (For for- in July tified boats Passage) of 2000 tons)		
Lt. Sogwatka, USN.,	Post-Franklin Expedition.	2	" 4 mths.	"	17 "
A.P. Low, F.R.G.S.	Director, Geo l. Surb. Exped. 1903-4		July 20	Nov. 1-15	"
J.W. Tyrrell,	Explorer, Engineer.		" 15	Nov. 1-15	16-18 "
W.A. Bowden,	Chief Eng. Dept. of Rys. & Marine.		Aug. 1	Nov. 1	13 "
Capt. J.E. Bernier,	Explorer Navigator	19	Variable	Variable	17 "
Capt. Bishop,	H.B. Company, "Prince of Wales"	Sev- eral	Aug. 1		
Walter Dickson,	Hudson Bay Company.	20	5 mths.		22 "
Capt. Silsby,		Sev- eral	July 1	Oct. 31	18 "
Capt. Wm. Kennedy,	Post-Franklin Expedition & H.B. Co., Un- gava Bay.	8	Aug. 1	Nov. 1	13 "
Capt. Hawes,	Hudson Bay Co.	14	July 15	Oct. 15	13 "
Capt. Thos. McKenzie,	Whaler, New Bedford	2	" 15-20	" 10-15	12-13 "
Capt. E.B. Fisher,	Whaler, E. Falmouth,	33	Variable	Variable	13-15 "
Capt. T.C. Clisby,	i/c Whaling fleet of C.A. Williams Co.	14	July 1	Oct. 31	18 "
Capt. John Spicer	Whaler, Grotan	20	July	Sept.	13 "
Capt. W. Coates,	H.B. Company, 1727-1751	24	" 1	" 15	11 "
Average of 27 opinions					15 "

## Types of Boats

Testimony before the special committee of the Senate 1919, tended to indicate that boats on this route should be limited in size to under 5,000 tons deadweight capacity - preferably 3,000 tons with 17-foot draught, specially designed to avoid the vertical sides typical of the lake carriers and with bows properly reinforced. Capt. Bernier thought any size of boat could be used provided the designs were correct, while W.A. Bowden, chief engineer of the Department of Railways and Canals, suggested boats of 7,500 to 8,500 deadweight tonnage and 25-foot draught as a maximum, and the committee in its report recommended reinforced ships of 5,000 - 10,000 tons deadweight capacity as being economical grain carriers. Nelson harbour is designed for boats drawing 23-24 feet of water. A 3,000 ton vessel could carry about 100,000 bushels of wheat. Most ocean going craft now being built run between 5,000-7,000 tons gross register, are about 400 feet long and draw 26 feet of water.

Rates of insurance in commercial vessels on this route will doubtless be high till such time as sufficient statistics can be secured to satisfy the insurance companies that risks are not abnormal. Government boats operating on this route in 1914 were asked to pay 11% on the voyage as a premium. As a result they carried no insurance and 38 vessels made the voyage successfully and with no losses.

## Harbour facilities.

The only harbour facilities on the west coast suitable for railway terminals are the natural facilities of Churchill and the partially constructed harbour at Port Nelson.

Churchill harbour is completely landlocked by rocky points and consists of a relatively small lagoon 30-40 feet deep with  $\frac{1}{2}$  square mile in which ocean going vessels can anchor and a larger basin 8 miles long and one to two miles wide, shallow and with a bottom of hardpan filled with boulders. The channel approach is short and 2,000 feet wide, well indicated and with a depth of 60 to 100 feet at the harbours entrance. The current is 5-6 miles per hour at ebb tide and the tide is uniformly 11-12 feet at its maximum, the harbour being approachable at all its stages, but is closed by ice cover 7 months of the year, from November 18th, to June 19th on the average. The river freezes about a month earlier. There is a good anchorage and a vessel of 240 foot draught can approach within 150 feet of the east side of the harbour. Dockage could be easily added.

The roadstead of the Nelson river has been partially converted into an artificial harbour by the engineers of the railway. It is a V. shaped estuary with a long and twisty approach 1,200-3,000 feet wide, 17-20 feet deep at low water and 20 miles long and with natural exposed anchorage available some distance from the post. The harbour works consist of a 17 - span bridge 3,500 feet long leading from the shore to an artificial island paralleling the channel. The island is built of filled timber cribs with docks. The anchorage will be 30 feet deep at low water and 50 feet at high water with a width of 100 feet. Tides range between 8 and 20 feet, average spring tides being 16 feet.



Floating ice, driven by tides and winds across the flats, will carry away buoys during August and after the 18th of October. Solid ice cover breaks up about June 1st. The estuary is open half of the year, and Dr. Robt. Bell of the Geological Survey reported that during the winter of 1879-80 it did not freeze across for some 40 miles above tide water. Vessels approaching the harbour get in touch by wireless and pick up their pilot 20 miles out from the inner anchorage. They can only enter the harbour at high tide and in severe weather are obliged to remain at sea.

While Hudson bay is not entirely frozen over during winter ice-cover is formed for 60 to 70 miles from the shores on the east coast often constituting a bridge between the islands and the mainland, and in other parts of the bay, where the shores are flat, solid ice extends to sea for from one to five miles.

#### Advantage of Route

With rail connection to Fort Nelson and boats travelling between Port Nelson and Liverpool certain parts of the west would be given the advantage of a shorter and less broken haul to Europe. In round figures for certain districts this saving is: Regina 1,050 miles; Calgary 1,150 miles; Saskatoon 1,175 miles; Prince Albert 1,300 miles; Melfort 1,300 miles; Edmonton 1,250 miles; much of which is in rail haul. The route seems especially attractive for live stock shipments due to the shorter rail haul and it is hoped that full wheat could be placed on the Atlantic during September and October of the same year. The distance from Port Nelson to Liverpool is 2,966 miles, and from Montreal via Belle Isle 2,767 miles and via St. Johns 3,097 miles. Return cargoes while obviously an uncertain quantity would no doubt be a direct development of increased buying powers in the west.

A new route is also furnished between England and Eastern Asia which via Suez, is about 16,000 miles, via New York and San Francisco about 11,000 miles and via Port Nelson and Prince Rupert less than 8,000 miles.

#### Hudson Bay Railway

The Hudson Bay railway, which connects at The Pas with the Canadian National Railway branch from the Winnipeg-Prince Albert line, is completed for 332 miles from The Pas to its second crossing of the Nelson river at Kettle rapids where a bridge has been built, leaving 92 miles of additional construction to complete the road, on which grading has already been done. The end of steel is 30 miles from the head of river navigation. Construction costs to date are approximately twenty million dollars including the work commenced at Port Nelson, amounting to over six millions. The Principal expenses still to be undertaken to make this an operating route are; costs of completed ocean terminals, elevators aids to navigation, etc., laying of steel for 92 miles, general physical rehabilitation of the road and purchase of rolling stock.

(COPY)

Port Nelson, Man. September 17, 1917.

W.A. Bowden, Esq.,  
Chief Engineer, Department Railways and Canals,  
O t t a w a, O n t.

Dear Sir,-

Many a time during the past four years I have been on the verge of coming out in absolute condemnation of the undertaking on which I am engaged, but so long as I thought there was a chance of the Hudson Bay Railway ever proving of value for any national purpose, I thought that I had better not do so, especially as I know that you have always been one of its staunchest supporters. In the light of the ice conditions of this year, which I observed carefully on August 13, 19, and September 6th, in the entrance to Port Nelson and the operation of our ships to and from Port Nelson for the past five seasons, I have come to the conclusion that the season for tramp steamships on this route is going to be so short that the cost of doing every item of work in the handling and transporting of merchandise is going to be so great that the route is not going to be able to compete with the lake route to Georgian Bay and rail to Montreal.

Port Nelson was this year blocked with ice on August 29, and there was still ice around the harbour entrance on September 6, proof of which I enclose.

The 'SHEBA' altered her course twice on the 12th of September to avoid ice within one hundred and fifty miles of Port Nelson. Though this year is extremely late as regards ice, yet it is quite usual to meet ice in the vicinity of Cape Tatnam until September. The extreme season will count in a commercial route. I also feel that we cannot extend the latter end of the season beyond the date on which our ships have been leaving in recent years, which means that the 15th of October will terminate commercial navigation, unless aeroplane reconnaissance of the Fox Channel ice flocs brings to light something new unknown.

Assuming for argument as long a season as can be hoped for viz two months between arrival of first ship at Port Nelson and departure of the last ship, I find that the Hudson Bay Railway route could not offer a greater rate to tramp steamers to come to Port Nelson than would be required to induce them to go to Montreal, and I feel that under equal rates the tramp steamer will prefer to go to Montreal rather than to Port Nelson, when sailing to or from a European port.

The ocean rate from Montreal is generally a liner rate not a tramp rate. When a tramp rate is quoted it is usually two cents in excess of the liner rate and less than seven cents has hardly ever been quoted, so that even if the Port Nelson route could get as good insurance at Montreal the best that can be offered would only equal the Montreal rate to tramps. On account of trans-shipping difficulties it is hardly possible to conceive of liners running to Port Nelson or package freight being handled in large quantities.



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In the figures given I have assumed that it will always cost twice as much to furnish the labour to handle a cargo at Port Nelson as it will cost to furnish the labour to handle a cargo in Fort William or Montreal, and I also assume that the operating cost per ton mile on the Hudson Bay Railway will be 40 per cent higher than a railway between Saskatoon and Fort William, both on account of the increased price of fuel and the shortness of the season, which I consider must synchronize with navigation from Port Nelson to Europe. I can prove that I am within the mark in many ways. If a man is brought here for two months' work as much will be paid out for transportation wages and time as there is for work done, provided no higher rate is paid than in Fort William and there is in addition the cost of assembling and disbanding the organization. Though transportation on these works has amounted to 28 per cent of the payroll, yet there is also a large amount of overhead charges carried by other accounts in the nature of waiting for the season and other things. The construction season here has been nearly three times as long as the operating season will be and one of the embarrassments of the future construction work will be the absence of work in April and May. The very thought of bringing together an organization to operate a port for two months with no other diversion but the loading of irregular ships and then disbanding again as abruptly, is, of itself, a most difficult task and its cost will be very nearly the cost of a similar organization elsewhere if operated for their season. The stationman on the Hudson Bay Railway makes \$10 per day for ninety days and does nothing the rest of the year. Our men here do nothing outside from November to April, and so it will be all time.

If you have any doubt re this matter, think of our experience with the stevedore. Time in, time out, transportation out, and ten hours when there are no ships.

I have no longer any hesitation the Hudson Bay Railway is doomed to certain failure. There may be fish in Hudson Bay, but there is no fishing season. There may be minerals on the east coast, but they are as accessible from Halifax as from Port Nelson.

There is nothing for the Hudson Bay north of the Huronian rock outcrops south of Split lake, so long as the St. Lawrence river route is available, and as for agricultural possibilities north of the same point, there are none.

Yours very truly,

(Sgd) D.W. McLAHLAN.

Ottawa, Ont. February 7, 1923.

MEMO. RE HUDSON BAY RAILWAY.

The Hudson Bay Railway, and the Port Nelson Harbour works stands in the following position:-

1. Eighty pounds steel rails are laid from The Pas to mile 333, which is the second crossing of the Nelson River.
2. The remainder from mile 333 to Port Nelson, mile 424 is graded but practically no bridges are built.
3. A steam-hauled train is operated from The Pas to mile 214 twice a month. On this section the ties are now from nine to ten years old, and they cannot hold up a steam locomotive any longer. Heavy expenditures on tie renewals are necessary.

4. The timber trestles all along the Hudson Bay Railway to mile 333 have heaved badly, and the telegraph line is also in very bad shape.
5. Large quantities of train hauled ballast would be required to put the 333 miles on which track is laid in shape to support heavy freight business, as the foundation grading is composed of vegetable material which shrinks when loaded.
6. In the 91 miles between the second crossing of the Nelson River, mile 333, and Port Nelson, there are two rivers to cross, viz., the Limestone and the Airhole. The bridge required in the latter case, is quite expensive, and will require a viaduct one hundred feet high and nearly one thousand feet long.
7. Though the 91 miles between mile 333 and Port Nelson is said to be graded, there is only a mound of vegetable material in place and 80 per cent of the work of making a satisfactory road-bed is yet to be performed in this section.
8. At Port Nelson an excellent base for operations has been established, and the work done on the artificial island, and on the bridge which connects it with the north shore has stood the test of storms, ice action and tides splendidly.
9. It could reasonably be said that the harbour works at Port Nelson are advanced to the point where work could soon be begun on sinking the cribs for the deep water dock face, which is designed to lie along a sloping hardpan surface about 800 feet north of the present estuary channel, and three-quarters of a mile south of the north shore of the estuary.
10. Very little of the 5,500,000 cubic yards of dredging which is required has been done. Up to the time when the work was shut down in 1917, all the plant was used in dredging crib sites, and obtaining gravel and stone from the river bed for the filling of the cribwork, as it was sunk in place.
11. Careful surveys of the channels leading from the proposed dock to deep water in Hudson Bay were made in 1918. These show that it will be feasible to provide for the accommodation of ships up to 26 feet draft, but no anchorage for such ships can be provided except at huge expense within 22 miles of the proposed docks.
12. The nature of the estuary and the foundation conditions in it did not permit anything in the nature of a shelter from storms to be provided in the design of the harbour works. It is hoped, however, that the 13 miles of shoal water between the docks and the relatively deep water of the bay will so break up the waves that ships will not suffer damage when lying against the wharves.
13. The strong tidal currents and the low distant shores will always prevent ships entering and leaving Port Nelson except during clear weather.
14. The chief difficulty and expense connected with the dredging at Port Nelson is the disposal of the material in a situation where it will not be subsequently dislodged or carried into the channel which it is proposed to use for navigation.
15. The navigation season for tramp ships entering and leaving Port Nelson will not be longer than from August 20 to October 20, and even in that period will not be entirely free from ice. In 1917 the estuary was blocked with ice on August 29, and in 1913, the Fox Channel ice in Hudson straits blocked the tramp ship ALLETTE and prevented her passing through on about the 10th of October.

DEPARTMENT OF RAILWAYS AND CANALS, CANADA.

Ottawa, Ont. December 1, 1922

Memo. to Chief Engineer re Hudson Bay Railway.

1. Note that the Department have decided to abandon the completion of the Hudson Bay Railway for the time being. During the past summer, I visited Port Nelson and travelled over the Hudson Bay Railway and it might be that I could assist the Department in carrying out their expressed intention in a manner that would save something from the total expenditure made in connection with the Hudson Bay Railway, and in a manner that would yield some benefits to the country adjacent thereto. The situation in connection with the Hudson Bay Railway may be briefly summarized as follows:

1. The ties in the first 214 miles north of The Pas have been in place for nine years, and are so rotten that unless something is done towards their replacement, the present heavy locomotive and standard cars operated on this section of the line will some day leave The Pas and never return.

2. About two years ago, 30,000 ties were hauled up from Ontario and distributed along the grade from The Pas to mile 214. These are still lying where they were dumped. They have greatly depreciated and they should be placed in the track soon, or they will be of no benefit to it.

3. The operation of the 214 miles north of The Pas, which has been conducted by steam locomotives and heavy equipment for the past four years, has shown a large annual deficit, and if the renewal of the ties had been attended to, the deficit would have been even greater. The line north of 214 has not been operated and has not contributed to this deficit. In fact, with no cost to the Department, private gas cars operating on it have brought beneficial traffic to the line south of 214.

4. The lifting and hauling out of the rails, fastenings, spikes, bolts, wire, timber and ties, which are now stored along the line, as well as the many sidings and spurs along the line, is I believe a proper procedure.

5. The lifting of the track from mile 279 to 333 may be a proper procedure, but the margin of profit from such a procedure will be small, as a large percentage of rails have become surface bent through use during construction period.

6. The lifting of the track from mile 214 to 279 is in my opinion not a proper procedure, on account of the fact that if the rails are left in their present position they will afford a useful means of access to the Split Lake country, which should not be taken away for the small profit that would be realized from the salvage of the track materials.

Assuming that completion of the Hudson Bay Railway and its extension is to be abandoned, then it seems to me that the following would be the proper procedure.

(a) Abandon the operation of the Hudson Bay Railway by steam north of mile 82.

(b) Renew the ties south of mile 82, and put the track in a condition that would be acceptable to the Railway Commissioners of Canada, so that it would be operated as a regular branch of the



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Canadian National System. The schedule of trains to be such that the regular crews operating between Hudson Bay Junction and The Pas could be used on this 82 miles north of The Pas, and also such that their time would be fully occupied.

(c) The operation of the Hudson Bay Railway between mile 82 and mile 279 be conducted by specially designed gasoline driven equipment with locomotives of the Plymouth, or the Swedish type.

(d) The jurisdiction and management of the Hudson Bay Railway north of mile 82 be taken away from the Canadian National system and vested in an officer reporting direct to the department.

(Sgd) D.W. McLachlan.

Engineer in Charge, Hudson Bay Railway Terminal.

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Ottawa, March 30, 1922

Memo to Chief Engineer re Hudson Bay Railway Terminals.

My evidence before the Senate Committee, which investigated the Hudson Bay Railway in April, 1919, covers the general features of Hudson Bay navigation and the features of Port Nelson as well as anything that I can present.

The length of season during which tramp steamers may pass through Hudson bay and straits, without meeting ice in sufficient quantities to retard their progress, is about two months, and extends from about August 20 to October 20.

To protect shipping in Hudson Bay during the beginning and the end of the above period, there would have to be some system of reporting ice fields, by airships and wireless, so that shipmasters could avoid the few ice fields that will be encountered late in August and early in October. In fact, it is possible that with these aids navigation may be extended so as to include all October.

The West Coast of Hudson bay, from Port Churchill to James bay, is very low and a ship to be in deep water must remain about 10 miles from shore. Port Nelson so called, is a fan-shaped estuary with a relatively narrow channel leading along its axis from deep water in Hudson bay to Flamborough Head, where the width of the estuary becomes narrowed to  $1\frac{1}{2}$  miles and its nature, changes from that of an estuary to a wide and irregular river with high cut banks.

The location which has been chosen for the docking facilities, is  $7\frac{1}{2}$  miles seaward from Flamborough Head, and 21 miles landward from deep water in Hudson bay, and at a point where the width is  $3\frac{1}{2}$  miles. This site was originally chosen because of the fact that the high cut clay banks on the north side of the Nelson River terminated there, and the low flat shores characteristic of Hudson bay, began, and extended northward for a hundred miles or more. Opposite the partly constructed docks, or artificial island, the natural estuary channel is about  $1\frac{1}{10}$  miles from shore, while 13 miles down the estuary towards the sea, it is  $5\frac{1}{2}$  miles from shore and at deep water in Hudson bay 21 miles from the

island, it is 8 miles from shore.

The scheme for providing shipping facilities which has been adopted consists of building a narrow artificial island, lying up and down stream three-quarters of a mile from shore, the front face of which will provide a berth with a depth of 30 feet at low water, and consists of a wall of cribwork about 54 feet high. The width of this island will be about 400 feet, and the back or inshore face will be formed by a retaining crib which holds the filling behind the main dock wall. It is about 26 feet high, and extends from about 2 feet below low water and about 5 feet above high water. Between this island and the shore, a steel bridge, consisting of 17 spans, making a total length of 3,300 feet, has been built and has stood the ice and tidal conditions very successfully. The island as it stands at present is half a mile long but it can be extended so as to give a length of 9,000 feet of dock face.

The tides at the dock have a rise and fall of 16 feet at ordinary spring tides, and 19 feet at the outer entrance to the estuary. These rises and falls are sometimes accentuated by unusual storms, to the extent of about 4 feet.

The depth of the main estuary channel, from deep water in Hudson bay to within 3 miles of the partly constructed docks, is just about deep enough to permit a ship drawing 26 feet to enter and leave Port Nelson at high tides. From the docks seaward, a distance of 3 miles, and along the dock face, a considerable amount of dredging is required in order to secure sufficient depth for the above ships to come and go from the wharves. The scheme contemplated for channel improvements involves the diverting of a considerable part of the flow from the natural estuary channel to that along the dock face, and it is expected that little or no silting up of the channels will take place after they are dredged to the required depth.

The tidal and channel conditions of this estuary, even after improvement, will require a ship to wait outside the entering channels in Hudson bay until high tide, and then when the tide is high, it must come in quickly with the tide and tie up to the wharf before it has fallen materially. It also contemplated that a ship when loaded, must arrange to leave the wharves a little before high tide, so as to traverse the distance, from the wharves to deep water in Hudson bay, a distance of about 22 miles, before the tide has fallen more than a few feet. As the steaming of this distance will require about  $2\frac{1}{2}$  hours, and as high water in Hudson bay occurs about forty minutes before it occurs at the wharf, it is not expected that full advantage of high tide can be taken. A greater depth than 29 ft. will not likely be available for ships at the time they reach the entrance to deep water in Hudson bay on outbound journey and it must be borne in mind that dredging here is hardly possible. In the middle third of the estuary channel, there is a length of about 7 miles which is deep enough for a ship to anchor and lie at low tides, but the conditions of the bottom and velocities of flow through are so great, that I do not believe it will ever be used by ships, as they would sometimes drag their anchor and get into trouble on the adjoining shoals and boulder ridges.

In order to make the entrance to Port Nelson safe for ordinary tramp steamers, ranges of lights that can be seen for 18 miles will have to be set up, and if possible, a permanent

lighthouse on an artificial island of cribwork should be constructed about 8 miles from shore. Even with these precautions, the entrance to Port Nelson can never be made safely during foggy weather, and the exposure of the estuary to winds is such that the navigating of it, and even the mooring of ships against its docks, will be a matter of inconvenience and possible danger during easterly gales.

An estimate of the cost of completing the work at Port Nelson for a given accommodation, is always difficult to make on account of the lack of precedent for the works there. Generally, the costs are found to be double those for similar work in the settled parts of Canada. The unit prices used in recent reports which the writer has made, were taken at 80 per cent above those found in pre-war times. For the completion of the works at Port Nelson, if undertaken, the first step would be the completion of the railway. An accommodation for 10 ships at once would be a reasonable proposal, and I have made the attached estimate on that basis,-

STATEMENT SHOWING ESTIMATED COST OF HARBOUR WORKS AT  
PORT NELSON FOR TEN 7,000 TON SHIPS ALL IN PORT AT  
THE SAME TIME.

Unit Prices 100% greater than prevailing in Montreal  
and Quebec in 1921.

Entrance channel and island to opposite Alette 20 ft. below low water, earth and boulders, 1,570,000 yds. at \$1.50.....	\$ 2,355,000	
Along dockface on island-		
4,400 ft. to 30 ft. below L.W.O.S.T. earth and boulders 2,700,000 yds. at \$1.00.....	2,700,000	
5,400 ft. to 15 ft. below L.W.C.S.T. earth and boulders 1,200,000 yds. at \$1.00.....	1,200,000	\$6,255,000
4,000 ft. dock walls at 77 yds. 308,000 @ \$12.	3,696,000	
Sinking and preparing crib seats		
308,000 at 4.00 .....	1,232,000	
3,000 ft. rear crib at 25 yds. 75,000 @ \$12..	900,000	
4,000 Ft. anchorage crib 12 yds. 48,000 @ \$12.	576,000	
Anchorage bolts 4,000 ft. at 200, 800,000 @ 14¢	112,000	
Filling of Island above elevator - 71,200,000 @ 50¢.....	60,000	\$ 7,116,000
4,000,000 bushel elevator at \$1.15 per bus....	4,600,000	
Railway Yard and terminal buildings.....	400,000	5,000,000
Lighthouse crib at entrance of harbour	300,000	300,000
		\$18,671,000
Add 10% for Engineering Management.....		1,867,000
Total.....		<u>\$20,538,000</u>

It seems to me that the mining country north and east of The Pas, Manitoba, will always justify the operation of the Hudson Bay Railway in the regular way being continued as far north as mile 82 north of The Pas. From this point to Piquitony, mile 214, or



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even to Kettle rapids, mile 332, the situation is different and should be looked at from another point of view.

The 80-pound steel rails north of Piquitony, mile 214, are probably worth lifting for use elsewhere, but if such a procedure is contemplated, I would like to see 30 or 40 - pound rails laid in their places, and a few gasoline driven cars purchased and put into operation in summer only, from mile 82 to the head of navigation on the Nelson river, about mile 375. These would be so light that nothing would have to be done with the track but renew the ties when they become useless. Such renewals would be less frequent than in railways carrying standard equipment, and would be small enough to be supplied from the adjoining country. This tie replacement charge would be reduced by creosoting to probably \$25,000 per year and the interest on the cost of extending the rail head 43 miles with 40-pound steel would probably be about \$25,000 per year, making a total obvious expense of \$50,000 per year. This is a sum probably twice what the traffic hauled would justify for commercial reasons, but when it is considered that a back door entrance to Canada would be provided and that part of the half million dollars worth of fur that yearly comes out of the Hudson Bay region might be marketed in Winnipeg instead of London, it might be worth considering. This expenditure might be regarded as a war or militia, or Police expenditure, and looked at from that point of view, it must appear small.

(Sgd) D.W.McLACHLAN.

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